

Research Article

Providing a Model for Measuring the Sustainable Development in Cities (Case Study: Mashhad city)

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Abstract: This applied study collects descriptive information by Delphi survey method as well as investigating in the field of significant correlation or lack of correlation of main hypotheses which have also the sub-hypotheses. The Main hypothesis is to have a significant correlation between the indicators of urbanization in Mashhad city and the sustainable development. Statistical sampling is done randomly and by using Cochran's formula. In this study, Kolmogorov and Smirnov test has been used in order to determine significant correlation between the independent and dependent variables and also the sub-hypotheses test by Pearson correlation coefficient method has been used. Moreover, in this study the factor analysis based on new and advanced method of structural equation (Partial Least Squares) PLS has been used in order to analyze and investigate the important coefficients and factors, estimate the coefficients of independent variables and even determine the effectiveness of each of the independent variables on each other. As a result of this research a significant correlation between the urbanization indicators and sustainable development is calculated and finally the suggestions are provided in order to continue and develop this study.

Keywords: Development indicators, sustainable development, urban development patterns, urbanization

INTRODUCTION

During recent hundred years, cities have attracted high percentage of world population. For the first time during the history, the total number of people, who live in cities, has reached the same number as the people living outside the cities. According to the estimations by The United Nations, more than 60% people around the world will live in urban areas until 2030. Despite occupying only about 2% of earth surface by the cities, they have half of world population which is increasing with the rate about 55 million people/year. They consume 3/4 of world resources and are the main producers of waste in the world (Egger, 2006). Due to the need for energy and food, the cities have become the large parasitic structures which undermine and deplete the world. Cities now absorb their sources and materials from all over the world (Hall, 2005). Depletion of the ozone layer has completely cleared the threat which is raised by the cities and their development mechanism. Mumford (2002) thinks that the future cities will be degraded to the lowest possible level of active, automatic and non-intentional life and to a completely without-feeling and affection level and machines govern the people's daily routine actions. In order to prevent the condition, which Mumford (2002) has predicted for future cities, a comprehensive research in the field of sustainable development of cities is needed.

Urban systems are not still advanced and efficient enough to cope with thousands tons waste which are imposed to the world ecosystem in the form of air pollution, sewage, packing and waste processes and Most of this waste cannot be decomposed naturally and can pollute the environment for a long time (Egger, 2006). Human places produce the waste 300 times more than what the environment produce naturally.

Structure of cities and their regional organizing will be changed significantly due to social and economic changes caused by the globalization and changes in the fields of communications and information and cities will require reconstructing themselves in order to be in line with these changes. By increasing the world domination of cities, the development and management of cities and areas around it are essential as the basis for creating the social and economic actions and interactions which should be better understood. Because the world's sustainability has become the current subject of world and reaching this sustainability without understanding the cities as the most important spatial physical aspects of human civilization seems impossible. Nowadays, the economic and social development programs can be implemented in the cities of developing countries by appropriate governance strategies. Indeed, the appropriate governance provides the platforms of private sector and citizens' participation in order to achieve the objectives of sustainable development. Sustainable development in urban areas is the ultimate objective of appropriate

governance. To have a sustainable urbanization economy, sustainable urban environment, sustainable urban housing, sustainable urban democracy, desired urban life are the aspects of appropriate urban governance. These objectives and ideals become the reality in light of acquiring the participation of private sector and public association and the solidarity and cooperation and the way of local sustainable development become paved. Indeed, the governance can achieve the highest level of sustainable development. In fact, the amount and intensity of governance effectiveness for achieving the sustainable development depends on the amount of power and governance authorities.

Sustainable development is a concept which defines the sustain ability aspect of certain conditions of development. Under this definition the available desirability and facilities caused by growth and development are not reduced for next generations and they are also considered. Sustainability, in its wide meaning, refers to the ability of communities, ecosystem and to continue the functioning with unlimited future. Sustainable development means improving the level of life under a limit area in environmental network. Sustainable development means a positive form of changes that the environmental networks, which the society depends on it, do not disappear. Sustainable development has become a global debate due to raising its own issues specifically and based on numerous theories it will be one of the central urbanization issues in 20th century. Sustainable development in research field focuses on politics, culture, economy, trade and environment. About the urban sustainable development and this question that what a sustainable city is, it can be stated that a sustainable city meets their own citizens' needs and increases the welfare without any damages to the nature or possible risk for people's living conditions.

In this study, we seek to evaluate the significant correlation of these indicators with status quo of Mashhad city by using the major indicators of sustainable development. On the other hand, we offer suggestions for budget sharing and allocation of resources by classifying these indicators in order to optimize the developmental programs.

LITERATURE REVIEW

In this section, the research background in the field of sustainable development including the economic sustainability, environmental sustainability, criteria for achieving the sustainable development and indicators of sustainable development are discussed and studied and some scholars' views in this field are expressed.

Evaluation and understanding the current status and barriers to urban sustainable development is among

the issues which nowadays are raised in urban planning (Hekmatnia, 2004). Using the indices of sustainable development in economic, social, cultural, health and educational aspects can be as an appropriate criterion both for urban services and overcoming the problems and inefficiencies in obtaining the economic welfare and community health in order to achieve the urban sustainable development. Gulland and Akcakaya (2001) Indicators of sustainable development should define the aspects of sustainable development. For instance, the major indicators of sustainable development are the social, economic, environmental and fundamental indicators (Berke and Conroy, 2000). Users of sustainable development indicators are so different from each other based on social, geographic and cultural features and also world and local scales. The implementation of indicators is impossible unless they are designed N exactly and precisely.

Harris and Rostam, (1383) believes that a sustainable economic system should provide and produce the goods and services during the time. Hancock (1990) wrote in his study entitled "Towards healthy and sustainable communities" that the economic activities should be compatible with the environmental needs and not destroy the ecological and social network. Thus, the Canadian Public Health Association has expressed that the human development and potential successes need a form of economic activities which is sustain able both for current and next generations based on social and environmental aspects.

In topic of environmental sustainability, Matouf (2000) believes that the evolution and change, which do not disturb the sustainability of society and cause its growth and sustainable development, is considered. In planning for implementing the sustainable development, the remains of resources and community should be considered as well as applying the resources available in the society in the process of evolution and change of the community. Mojtahezadeh (1999) stated in his study that the sustainability finds its own roots in the ecological sustainability. This theory emphasizes on this point that the nature presents certain limitations and opportunities for human life. Consequently, the sustainability accepts a development which uses there sources in the best way, but does no harm to them.

In the field of criteria for accessing to sustainable development, Salami (1997) believes that the first step in achieving the sustainable development is to preparation and develop the macro strategy by using the factors such as the national strategy of environmental protection, resuscitation and improvement of environment and national strategy of social and cultural sustainable development. Ebrahimzadeh (2003) believes that the appropriate planning and a proper strategic selection requires using the experience of

Table 1: Indicators of sustainable development

No.	Indicator	Group	No.	Indicator	Group
1	Applied green space per capita	Environmental	8	Literacy percentage	Cultural
2	City parks per capita	Environmental	9	Number of kindergarten for thousand people	Educational
3	Hospital beds for 20 thousand people	Health	10	Number of school classes for thousand people	Educational
4	Number of general practitioner for 4500 people	Health	11	Inverse density of students	Educational
5	Number of specialist physician for ten thousand people	Health	12	Teachers to students ratio	Educational
6	Number of pharmacies for 7000 people	Health	13	Percentage of applied communicational network	Fundamental
7	Number of gyms for ten thousand people	Cultural	14	Service application per capita	Fundamental

Table 2: Comparing the conducted studies

No.	Name of researcher	Year	Research subject
1	Baster	1972	Development indicators: an introduction
2	Asayesh	1995	Principles and practices of rural planning
3	Kalantari	1996	Identification of backward region in Iran
4	Mojtahedzadeh	1999	Meaning and concept of sustainable development in urban areas
5	Berke and Conroy	2000	Are we planning for sustainable development?
6	Matouf	2000	Role of culture, participation and environment in regional sustainable development
7	Gulland and Akcakaya	2001	Sustainability indices for exploited populations
8	Hancock	1990	Towards healthy and sustainable communities
9	McEvoy and Ravetz	2001	Toolkits for regional sustainable development
10	Mumford	2002	Civilization and civil society in the historical context
11	Ebrahimzadeh	2003	Sustainable development
12	Hekmatnia	2004	Space planning of sustainable development in Yazd city
13	Harris and Rostam	1383	Principles of sustainable development
14	Egger	2006	Determining a sustainable city model
15	Raisdana	2005	Measurement of indicator and scanning the poverty in Iran
16	Egger	2006	Determining a sustainable city model
17	Hall	2005	Urban geography

other countries in the field of cultural, educational and health development in order to achieve a sustainable development. Barrow (1995) has stated in his study that if we imagine that there is only one specified and certain way for achieving the sustainable development, this idea seems unlikely and incorrect. United Nations Development Program (2004) considers that high participation of all people in decision-making is one of the fundamental preconditions for achieving the sustainable development. McIvor believes that achieving the sustainable development requires considering the development program as the logical strategy in line with the sustainable development (McEvoy and Ravetz, 2001). It should be noted that generally the factors such as the fast growth of population, natural resources degradation, shortages of water, land and energy, poverty, unemployment, low per capita income, unequal distribution of income, etc are considered as the major barriers to sustainable development.

Kalantari (1996) considers that determining the indices of sustainable development are the most important step in studies of urban development and in fact the statistical expression of phenomena existing in the city. Asayesh (1995) believes that the indicators are the figures which are used for measuring and evaluating the fluctuations of variable factors during the time. Raisdana (2005) considers that choosing the appropriate

indicator for each community depends on available statistics, the nature and demographic composition, income, planning goals and researcher's viewpoints. Baster (1972) considers the ability of applied indicators and goals of planning as the major planning applications.

Maleki (2011) has provided almost complete set of sustainable development indicators by library studies and review of relevant studies. The numbers of indicators are 55 and are categorized into 10 groups including the economic, social, cultural, physical, environmental, healthcare, educational, cultural infrastructure, health infrastructure and educational infrastructure groups. Among these indicators, 14 indicators in 5 groups are selected and studied according to Table 1 in order to facilitate designing the measurement model of sustainable development.

A comparative table (Table 2) of conducted studies, which area selection of reviewed study and library studies in line with the subject of this study, is presented.

Expressed views can be unapplied; hence, a new viewpoint based on different needs can be presented in terms of environment and time.

Need for conducting the research: Cities have been developed as a system to assist in providing the human objectives. Despite the fact that cities have a history of

more than 10,000 years, only in recent 200 years they have become as the most obvious feature of human and population. If we take more attention, we can find that just before the 1st World War the farmers made large groups of population in most of the countries and even 100 years before it the farmers had made approximately all population of the whole world. By this way, we can better understand the central role of cities in determining the future conditions of human and the world. The effect level of a city on the environment, distinguishes it from other systems inside the world ecosystem. For instance, in other system of global ecosystem, the concept of waste differs to an extent from what is made by urban regions of contemporary society. There is no waste accumulation in biological systems, as its all products returns to biological process as a continuous and integrated process. In contrast, Urban systems are not still advanced and efficient enough to cope with thousands tons waste which are imposed to the world ecosystem in the form of air pollution, sewage, packing and waste processes and Most of this waste cannot be decomposed naturally and can pollute the environment for a long time. Human places produce the waste three hundred times more than what the environment produce naturally. On the other hand, the results of sustainable development indicators indicate that the cities have had heterogeneous growth in sustainable development indicators. One of the most important problems in the field of implementing the sustainable development is that how the significant correlation of sustainable development indicators can be determined and evaluated and how much investment or resources should be allocated to each indicator in order to achieve a balanced growth.

Providing a vector model with linear regression method, this study attempts to examine the selected indicators based on the significant correlation and achieve a homogeneous mathematical equation from these indicators in order to use them as the model in relevant projects.

RESEARCH METHODOLOGY

Research methodology in the present study is applied based on the objective and descriptive based on data and information collection and is a kind of Delphi survey which aims to achieve a consensus of experts familiar with the subject of study.

Research method: In this study, first the study plan is raised and the literature collected and then a questionnaire is proposed for statistical population by designing the conceptual model. Finally, the conclusion and suggestions are provided after distributing and collecting the questionnaires and respondents' comments and based on data analysis. The major carried out tasks and activities in this study include determining the hypotheses of study, statistical

population, sampling method, research area, data analysis, determining the validity and reliability of questionnaire and testing the hypotheses of study which their definitions and procedures are presented as follows.

Research hypotheses: Research hypotheses are obtained from the main question. The main question is whether these indicators of urbanization in Mashhad city have a significant correlation with the sustainable development? Thus the sustainable development can be defined as the dependent variable and the defined indicators in Table 1 can be determined as the independent variables. Then, the independent variables, defined in this study, include:

- Applied green space per capita
- City parks per capita
- Hospital beds for 20,000 people
- Number of General Practitioner for 4500 people
- Number of Specialist physician for 10,000 people
- Number of pharmacies for 7000 people
- Number of gyms for 10,000 people
- Literacy Percentage
- Number of Kindergarten for thousand people
- Number of school classes for 1000 people
- Inverse density of students
- Teachers to students ratio
- Percentage of applied communicational network
- Service application per capita

Main hypothesis: There is a significant correlation between the indicators of urbanization and sustainable development in Mashhad city.

Subsidiary hypotheses:

- There is a significant correlation between the applied green space per capita and the sustainable development.
- There is a significant correlation between the city parks per capita and the sustainable development.
- There is a significant correlation between the hospital beds for 20,000 people and the sustainable development.
- There is a significant correlation between the number of General Practitioner for 4500 people and the sustainable development.
- There is a significant correlation between the number of Specialist physician for ten thousand people and the sustainable development.
- There is a significant correlation between the number of pharmacies for 7000 people and the sustainable development.

- There is a significant correlation between the number of gyms for 10,000 people and the sustainable development.
- There is a significant correlation between the literacy percentage and the sustainable development.
- There is a significant correlation between the number of Kindergarten for 1000 people and the sustainable development.
- There is a significant correlation between the number of school classes for 1000 people and the sustainable development.
- There is a significant correlation between the inverse density of students and the sustainable development.
- There is a significant correlation between the teachers to student ratio and the sustainable development.
- There is a significant correlation between the percentage of applied communicational network and the sustainable development.
- There is a significant correlation between the service application per capita and the sustainable development.

Statistical population, sample and sampling method:

Statistical population in this study consists of 410 questionnaires. Sampling method is random and the number of samples is estimated 199 by using Cochran's formula. Eleven people were added to the number of statistical sample so the total number of questionnaire increased to 210:

$$n_{cochran} = \frac{\frac{P(1-p)Z^2_{1-\frac{\alpha}{2}}}{d^2}}{1 + \frac{\frac{P(1-p)Z^2_{1-\frac{\alpha}{2}}}{d^2}}{N}}$$

$$= \frac{\frac{0.5*0.5*(1.96)^2}{(0.05)^2}}{1 + \frac{\frac{0.5*0.5*(1.96)^2}{(0.05)^2}}{410}}$$

$$= \frac{384.16}{1.9345} \cong 199$$

In which,

P = 0.5 : Occurrence of a trait in the population is considered equal to 0.5 due to the unavailability

Z_{1-α/2} : 1.96 (α = 0.05)

d = 0.05 : Maximum acceptable error

N = 410 : Population size

n_{cochran} : Sample size

Since it is predicted that some respondents do not complete their questionnaires, 11 people were added to

the number of sample, so the total number of questionnaires increased to 210, of which 206 answer sheets were completed.

Data analysis methods: First, Kolmogorov Smirnov test has been used in order to study the normalization of data leakage. Pearson correlation coefficient test has been selected in order to determine the correlation or lack of correlation of main hypothesis and subsidiary hypothesis. The Partial Least Squares (PLS) method has been used in order to determine the correlation of subsidiary hypotheses:

- Applied green space per capita
- City parks per capita
- Hospital beds for 20 thousand people
- Number of General Practitioner for 4500 people
- Number of Specialist physician for ten thousand people
- Number of pharmacies for 7000 people
- Number of gyms for ten thousand people
- Literacy Percentage
- Number of Kindergarten for thousand people
- Number of school classes for thousand people
- Inverse density of students
- Teachers to students ratio
- Percentage of applied communicational network
- Service application per capita

As the independent variable with the sustainable development as the dependent variable in Mashhad city.

Data collection tool, validity and reliability of questionnaire:

As noted, the questionnaire is the data collection tool in this study. In the present study, the information is compiled by implementing the questionnaire with closed questions (7 options). Designed questionnaire was first distributed among the preliminary sample (30 people) of statistical sample and after investigating its defects were eliminated by using the experts' views. In the next step, two final standard questionnaires were distributed and collected after determining the validity in order to measure the empowerment of human resources and effectiveness of organization.

The validity of a study means the accuracy of criteria and indicators which are prepared for measuring the target phenomenon. Spreitzer (1995) questionnaire has been used in order to indicators of urbanization. Moreover, Neefe (2001) questionnaire has been used in order to measure the indicators of sustainable development. Since both questionnaires are standardized, their validity has been confirmed in numerous local and foreign studies.

Reliability or stability means having the features of reproducibility, stability and consistency in the measurement tool and measures that to what extend the measurement tool examines the needed concept. Since both questionnaires are standard, their reliability has been confirmed in numerous local and foreign studies. Furthermore, the Cronbach's alpha is calculated for in order to ensure more for the reliability test in this study by the help of software SPSS 15. The formula for calculating this coefficient is as follows:

$$\alpha = \left(\frac{j}{j-1}\right)\left(1 - \frac{\sum s_j^2}{s^2}\right)$$

- α = The estimated test reliability
- j = Number of test questions
- s_j^2 = Variance of subset j
- s^2 = The total variance of test

This value is calculated higher than 75% for both questionnaires.

RESULT ANALYSIS

Evaluating the normalization of sample distribution by using Kolmogorov-Smirnov test: Kolmogorov-Smirnov test and the results of Table 3 have been used in order to examine the normalization of urbanization and sustainable development indicators in cities.

Given the significant level higher than 5%, the normalization of sample distribution is not rejected. Relationship of urbanization and sustainable development indicators in cities as shown in Fig. 1.

Table 3: One-sample Kolmogorov-Smirnov test

	Urbanization indicators	Sustainable development in cities
Kolmogorov-Smirnov Z	2.560	2.030
Asymp. sig. (2-tailed)	0.120	0.096

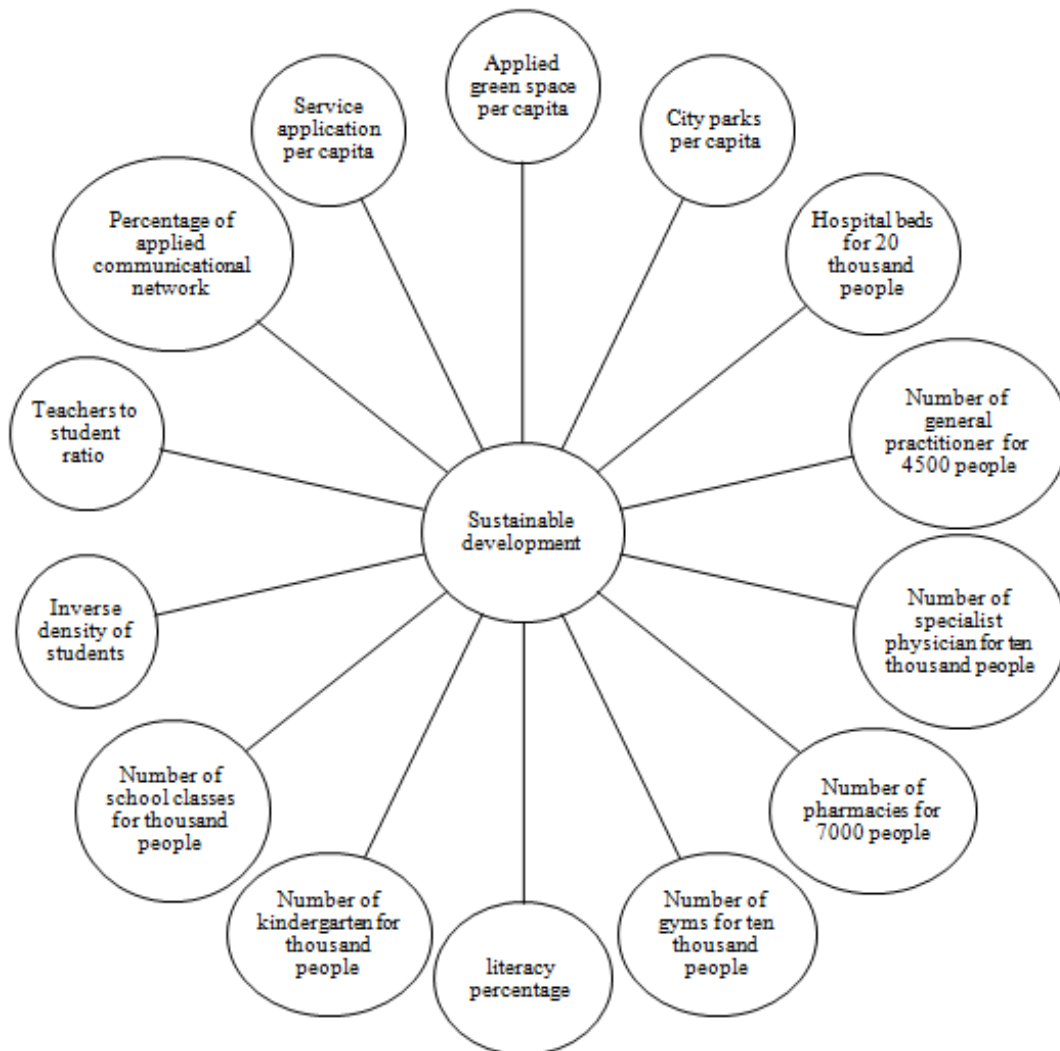


Fig. 1: Relationship of urbanization and sustainable development indicators in cities

Table 4: Pearson correlation coefficients for sub-hypotheses

Urbanization indicators	Correlation coefficient	Sig.	Test results
Applied green space per capita	0.467	0.0001	Hypothesis and a significant and direct correlation are confirmed
City parks per capita	0.491	0.0002	Hypothesis and a significant and direct correlation are confirmed
Hospital beds for 20 thousand people	0.574	0.0005	Hypothesis and a significant and direct correlation are confirmed
Number of general practitioner for 4500	0.533	0.0001	Hypothesis and a significant and direct correlation are confirmed
Number of specialist physician for ten thousand people	0.441	0.0003	Hypothesis and a significant and direct correlation are confirmed
Number of pharmacies for 7000 people	0.512	0.0005	Hypothesis and a significant and direct correlation are confirmed
Number of gyms for ten thousand people	0.507	0.0004	Hypothesis and a significant and direct correlation are confirmed
Literacy percentage	0.616	0.0007	Hypothesis and a significant and direct correlation are confirmed
Number of kindergarten for thousand people	0.486	0.0003	Hypothesis and a significant and direct correlation are confirmed
Number of school classes for thousand people	0.663	0.0000	Hypothesis and a significant and direct correlation are confirmed
Inverse density of students	0.462	0.0001	Hypothesis and a significant and direct correlation are confirmed
Teachers to students ratio	0.518	0.0002	Hypothesis and a significant and direct correlation are confirmed
Percentage of applied communicational network	0.726	0.0005	Hypothesis and a significant and direct correlation are confirmed
Service application per capita	0.328	0.0001	Hypothesis and a significant and direct correlation are confirmed

Results of Pearson correlation coefficient: In the following table (Table 4), the results of the research sub-hypothesis test are presented:

- The correlation coefficient of applied green space per capita is 0.467 and the statistics is 0.001. This suggests that the there is a significant and direct correlation between the indicators of urbanization in Mashhad city and sustainable development at confidence level 95%.
- The correlation coefficient of city parks per capita is 0.491 and the statistics is 0.002. This suggests that the there is a significant and direct correlation between the indicators of urbanization in Mashhad city and sustainable development at confidence level 95%.
- The correlation coefficient of hospital beds for 20,000 people is 0.574 and the statistics is 0.005. This suggests that the there is a significant and direct correlation between the indicators of urbanization in Mashhad city and sustainable development at confidence level 95%.
- The correlation coefficient of number of General Practitioner for 4500 people is 0.533 and the statistics is 0.001. This suggests that the there is a significant and direct correlation between the indicators of urbanization in Mashhad city and sustainable development at confidence level 95%.
- The correlation coefficient of number of Specialist physician for 10,000 people is 0.441 and the statistics is 0.003. This suggests that the there is a significant and direct correlation between the indicators of urbanization in Mashhad city and sustainable development at confidence level 95%.
- The correlation coefficient of number of pharmacies for 7000 people is 0.512 and the statistics is 0.005. This suggests that the there is a significant and direct correlation between the indicators of urbanization in Mashhad city and sustainable development at confidence level 95%.
- The correlation coefficient of number of gyms for 10,000 people is 0.507 and the statistics is 0.004. This suggests that the there is a significant and direct correlation between the indicators of urbanization in Mashhad city and sustainable development at confidence level 95%.
- The correlation coefficient of literacy Percentage is 0.616 and the statistics is 0.007. This suggests that the there is a significant and direct correlation between the indicators of urbanization in Mashhad city and sustainable development at confidence level 95%.
- The correlation coefficient of number of Kindergarten for 1000 people is 0.486 and the statistics is 0.003. This suggests that the there is a significant and direct correlation between the indicators of urbanization in Mashhad city and sustainable development at confidence level 95%.
- The correlation coefficient of number of school classes for 1000 people is 0.663 and the statistics is 0.000. This suggests that the there is a significant and direct correlation between the indicators of urbanization in Mashhad city and sustainable development at confidence level 95%.
- The correlation coefficient of inverse density of students is 0.462 and the statistics is 0.001. This suggests that the there is a significant and direct correlation between the indicators of urbanization in Mashhad city province and sustainable development at confidence level 95%.
- The correlation coefficient of teachers-to-students ratio is 0.518 and the statistics is 0.002. This suggests that the there is a significant and direct correlation between the indicators of urbanization in Mashhad city and sustainable development at confidence level 95%.

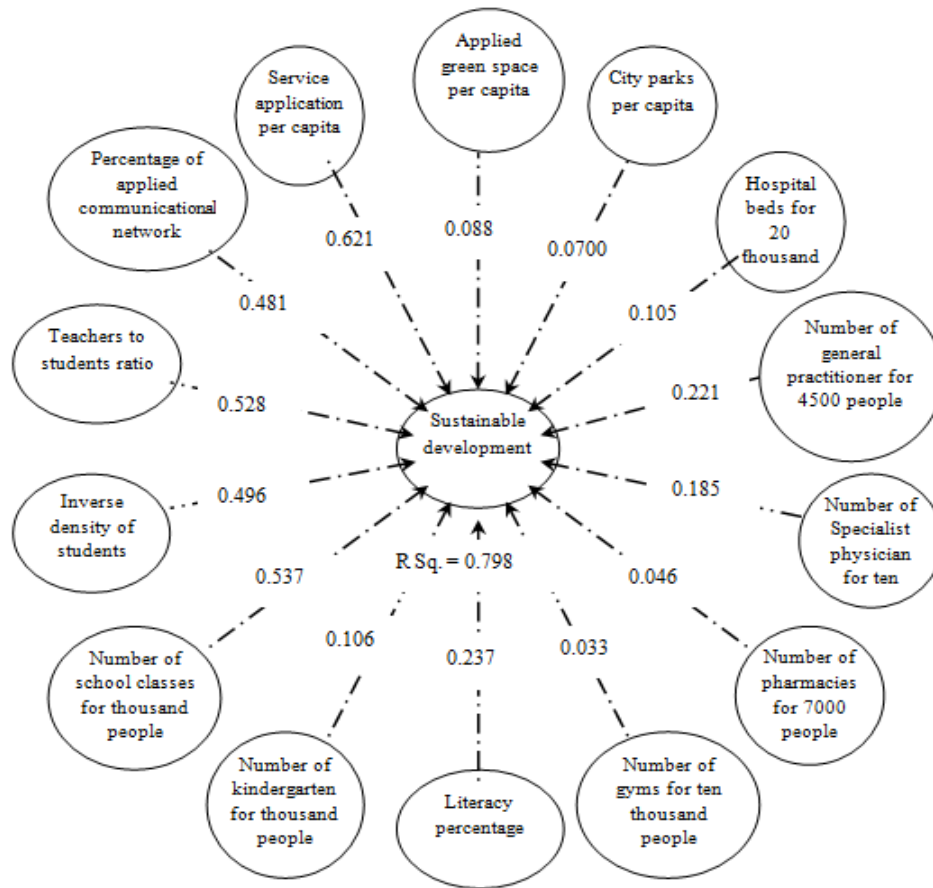


Fig. 2: Structural equations of software VPLS output

suggests that there is a significant and direct correlation between the indicators of urbanization in Mashhad city and sustainable development at confidence level 95%.

- The correlation coefficient of percentage of applied communicational network is 0.762 and the statistics is 0.005. This suggests that there is a significant and direct correlation between the indicators of urbanization in Mashhad city and sustainable development at confidence level 95%.
- The correlation coefficient of service application per capita is 0.328 and the statistics is 0.001. This suggests that there is a significant and direct correlation between the indicators of urbanization in Mashhad city province and sustainable development at confidence level 95%.

Factor analysis for main variables and factors: In this section, the factor analysis method based on new and advanced method of structural equation VPLS (Visual Partial Least Square) is used in order to analyze and study the important coefficients and factors, estimate the coefficients of independent variables and determine the effectiveness of each of independent variables on each other. Figure 2 shows the output of

software VPLS containing the coefficients of variables and their significance (t-statistics).

According to the above graph, the coefficient of determination is ($R = 0.798$) and this indicates that the dependent variable changes (Sustainable development) are explained and described with aspects of following subsidiary hypotheses with estimation 80% in this research:

- Applied green space per capita
- City parks per capita
- Hospital beds for 20,000 people
- Number of General Practitioner for 4500 people
- Number of Specialist physician for 10,000 people
- Number of pharmacies for 7000 people
- Number of gyms for 10,000 people
- Literacy Percentage
- Number of Kindergarten for 1000 people
- Number of school classes for 1000 people
- Inverse density of students
- Teachers to students ratio
- Percentage of applied communicational network
- Service application per capita

Table 5: Estimating the model coefficients

Urbanization indicators	Estimating the model coefficients	Student's t	Result
Applied green space per capita → sustainable development in cities	0.088	2.031	Significant and direct correlation
City parks per capita → sustainable development in cities	0.070	1.997	Significant and direct correlation
Hospital beds for 20 thousand people → sustainable development in cities	0.105	2.061	Significant and direct correlation
Number of general practitioner for 4500 people → sustainable development in cities	0.221	2.510	Significant and direct correlation
Number of specialist physician for ten thousand people → sustainable development in cities	0.185	2.594	Significant and direct correlation
Number of pharmacies for 7000 people → sustainable development in cities	0.046	1.982	Significant and direct correlation
Number of gyms for ten thousand people → sustainable development in cities	0.033	3.052	Significant and direct correlation
Literacy percentage → sustainable development in cities	0.237	3.041	Significant and direct correlation
Number of kindergarten for thousand people → sustainable development in cities	0.106	2.594	Significant and direct correlation
Number of school classes for thousand people → sustainable development in cities	0.537	3.560	Significant and direct correlation
Inverse density of students → sustainable development in cities	0.492	1.716	Significant and direct correlation
Teachers to students ratio → sustainable development in cities	0.528	1.927	Significant and direct correlation
Percentage of applied communicational network → sustainable development in cities	0.481	2.346	Significant and direct correlation
Service application per capita → sustainable development in cities	0.621	2.951	Significant and direct correlation

Impact coefficient of each of independent variables on the dependent variable and the t-statistic are presented in Table 5 in order to study the significance of variables.

Value of estimated student's t for each of model coefficients is higher than confidence level 95% (1.96), so it can be concluded the research hypotheses are confirmed as follows:

- With a unit increase in applied green space per capita, the sustainable development is increased to 0.088.
- With a unit increase in the city parks per capita, the sustainable development is increased to 0.070.
- With a unit increase in the hospital beds for 20,000 people, the sustainable development is increased to 0.105.
- With a unit increase in the number of General Practitioner for 4500 people, the sustainable development is increased to 0.221.
- With a unit increase in the number of Specialist physician for 10,000 people, the sustainable development is increased to 0.185.
- With a unit increase in the number of pharmacies for 7000 people, the sustainable development is increased to 0.046.
- With a unit increase in the number of gyms for 10,000 people, the sustainable development is increased to 0.033.
- With a unit increase in the literacy percentage, the sustainable development is increased to 0.237.
- With a unit increase in the number of kindergarten for 1000 people, the sustainable development is increased to 0.106.
- With a unit increase in the number of school classes for 1000 people, the sustainable development is increased to 0.537.

- With a unit increase in the inverse density of students, the sustainable development is increased to 0.492.
- With a unit increase in the teachers-to-students ratio, the sustainable development is increased to 0.528.
- With a unit increase in the percentage of applied communicational network, the sustainable development is increased to 0.481.
- With a unit increase in the service application per capita, the sustainable development is increased to 0.621.

CONCLUSION

- Kolmogorov-Smirnov test shows that given the significance level of variables (Sustainable development equal to 2.03 and urbanization indicators in Mashhad city equal to 2.56) is higher than 5%, the normalization hypothesis of sample distribution is not rejected
- Pearson correlation coefficient test (Table 4) shows that the absolute value of correlation coefficient invariables of sub-hypotheses:
 - Applied green space per capita
 - City parks per capita
 - Hospital beds for 20,000 people
 - Number of General Practitioner for 4500 people
 - Number of Specialist physician for 10,000 people
 - Number of pharmacies for 7000 people
 - Number of gyms for 10,000 people
 - Literacy Percentage
 - Number of Kindergarten for 1000 people
 - Number of school classes for 1000 people
 - Inverse density of students
 - Teachers to students ratio

- Percentage of applied communicational network
 - Service application per capita (Fig. 1) is equal to 0.467, 0.491, 0.574, 0.533, 0.441, 0.512, 0.507, 0.616, 0.486, 0.663, 0.462, 0.518, 0.726 and 0.328, respectively and the Sig-statistics for all variables is equal or smaller than 0.007. These calculations indicate that there is a significant direct correlation between the variables of life skills (defined in this study) and the sustainable development
 - Analyzing and evaluating the computational results of new and advanced method of structural equations by Visual Partial Least Square (VPLS) indicate that the value of estimated student's t for each of the model coefficients is higher than the confidence level 95% and it can be concluded that the research hypotheses are confirmed with the following coefficients (Fig. 2). In addition, the calculation coefficients represent the following cases:
 - As presented in above Figure, the value of coefficient of determination ($R = 0.798$) and this indicates that the dependent variable changes (sustainable development in the cities) are explained and described with indicators of urbanization in Mashhad city in this study with estimation 80%
 - With a unit increase in sub-hypotheses:
 - Applied green space per capita
 - City parks per capita
 - Hospital beds for 20,000 people
 - Number of General Practitioner for 4500 people
 - Number of Specialist physician for 10,000 people
 - Number of pharmacies for 7000 people
 - Number of gyms for 10,000 people
 - literacy Percentage
 - Number of Kindergarten for 1000 people
 - Number of school classes for 1000 people
 - Inverse density of students
 - Teachers to students ratio
 - Percentage of applied communicational network
 - Service application per capita
- The sustainable development is decreased equal to 0.088, 0.070, 0.105, 0.221, 0.185, 0.046, 0.033, 0.237, 0.106, 0.537, 0.492, 0.528, 0.481 and 0.621, respectively
- Regression equation of correlation between the urbanization indicators in Mashhad city (defined variables) and the sustainable development is as follows:

$$Y = a + 0.088x_1 + 0.070x_2 + 0.105x_3 + 0.221x_4 + 0.185x_5 + 0.046x_6 + 0.033x_7 + 0.237x_8 + 0.106x_9 +$$

$$0.537x_{10} + 0.492x_{11} + 0.528x_{12} + 0.481x_{13} + 0.621x_{14}$$

In which, a represents the constant value in the regression equation

Variables x in the model represent the sub-variables:

- Applied green space per capita
- City parks per capita
- Hospital beds for 20,000 people
- Number of General Practitioner for 4500 people
- Number of Specialist physician for 10,000 people
- Number of pharmacies for 7000 people
- Number of gyms for 10,000 people
- Literacy Percentage
- Number of Kindergarten for 1000 people
- Number of school classes for 1000 people
- Inverse density of students
- Teachers to students ratio
- Percentage of applied communicational network
- Service application per capita, respectively

Model parameters represent the impact coefficient of independent variables in the model

RECOMMENDATIONS

One of the main results of this study is to determine the values of correlation coefficient between the dependent and independent variables. It is recommended that the following cases should be considered and applied by the readers by using the process of study in this study:

- Resource allocation or costing the reconstruction and urban development projects can be considered based on the regression equation coefficients provided in the executive projects. Rate percentage of each index can be calculated through normalizing the coefficients of each index by the regression equation.
- Using the Friedman test for ranking the urbanization indicators in Mashhad city for metropolitan planning and selection of program priorities.
- Determining other indicators of urbanization in Mashhad city and testing them based on the Durbin-Watson statistic.

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